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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/732,177	12/07/2000	Kenichi Hasegawa	116-002064	1420

28289 7590 07/18/2005

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EXAMINER

SHARON, AYAL I

ART UNIT	PAPER NUMBER
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2123

DATE MAILED: 07/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/732,177

Applicant(s)

HASEGAWA, KENICHI

Examiner

Ayal I. Sharon

Art Unit

2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09 May 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☒ None of:
- 1) ☒ Certified copies of the priority documents have been received.
- 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
- 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Introduction***

1. Claims 1-12 of U.S. Application 09/732,177 originally filed on 12/07/2000 are presented for examination.
2. Applicant's arguments, see Applicant's Response, filed 5/9/05, with respect to the rejection(s) of claim(s) 1-12 under Schenck in view of Kiyoshi, and further in view of Ishibashi have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Morich.
3. Therefore, this Office Action is Non-Final.

### ***Priority***

4. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Japan on 12/07/1999. It is noted, however, that applicant has not filed a certified copy of the Japanese application as required by 35 U.S.C. 119(b).

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. The prior art used for these rejections is as follows:
7. Morich, M. U.S. Patent 5,296,810. Date of Patent: March 22, 1994. (Henceforth "Morich").
8. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.
9. **Claims 1, 4, 6, 7, 10 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Morich.**
10. In regards to claim 1, Morich teaches the following:
  1. A method of designing a magnetic field gradient coil assembly using tightly wound inner and outer coils, said method comprising the steps of:

(See Morich, especially: col.1, line 65 to col.2, line 10)

setting or resetting the number of said inner coils and optimizing their positions such that a resulting magnetic field strength falls within a tolerable range of a target magnetic field gradient under shielded conditions;

(See Morich, especially: Fig.7, Item 100 and associated text at col.7, lines 17-29)

setting or resetting the number of said outer coils and the number of turns of each outer coil;

(See Morich, especially: Fig.7, Item 110 and associated text at col.7, lines 29-41)

calculating Fourier components of an electric current spatial distribution necessary for the outer coils;

(See Morich, especially: Fig.7, Item 120; and col.7, line 41 to col.8, line 2; and col.8, line 51 to col.9, line 32)

optimizing positions of the outer coils to approximate the Fourier components of the current distribution;

(See Morich, especially: Fig.7, Item 124 and associated text at col.8, lines 3-12)

calculating magnetic fields leaking from the inner and outer coils, respectively;

(See Morich, especially: Fig.7, Item 130 and associated text at col.8, lines 34-50)

calculating magnetic field distortions caused by eddy currents produced by the leaking magnetic fields; and

(See Morich, especially: col.1, line 30 to col.2, line 10; and col.12, Eq.28, where "... the  $j > 1$  derivatives represent contaminants.")

resetting the number of the outer coils and the number of turns of each outer coil such that the magnetic field distortions caused by eddy currents fall within a tolerable range.

(See Morich, especially: Fig.7, Item 132 and associated text at col.8, lines 38-50; and col.12, Eq.28, where "... the  $j > 1$  derivatives represent contaminants." )

11. In regards to claim 4, Morich teaches the following:

4. A method of designing a magnetic field gradient coil assembly as set forth in claim 1, wherein said step of optimizing the positions of the outer coils to approximate the Fourier components of the current distribution performs the approximation using a small number of tightly wound coils.

(See Morich, especially: Fig.7, Item 110 and associated text at col.7, lines 29-41)

12. In regards to claim 6, Morich teaches the following: 6. A method of designing a magnetic field gradient coil assembly as set forth in claim 1, wherein said step of resetting the number of the outer coils and the number of turns of each outer coil if the magnetic field distortions are outside the tolerable range,

said step of calculating Fourier components of an electric current distribution necessary for the outer coils,

(See Morich, especially: Fig.7, Item 120; and col.7, line 41 to col.8, line 2; and col.8, line 51 to col.9, line 32)

said step of optimizing the positions of the outer coils to approximate the Fourier components of the current distribution,

(See Morich, especially: Fig.7, Item 124 and associated text at col.8, lines 3-12)

said step of calculating magnetic fields leaking from the inner and outer coils, respectively, and

(See Morich, especially: Fig.7, Item 130 and associated text at col.8, lines 34-50)

said step of calculating magnetic field distortions caused by eddy currents produced by the leaking magnetic fields are repeatedly carried out to determine optimum conditions for the outer coils by trial and error.

(See Morich, especially: Fig.7, Item 134 and associated text at col.8, lines 45-50)

13. Claims 7, 10 and 12 are rejected based on the same reasoning as claims 1, 4, and 6. Claims 7, 10, and 12 are magnetic field gradient coil assembly claims that recite limitations equivalent to those in method claims 1, 4, and 6, which are taught throughout Morich.

***Claim Rejections - 35 USC § 103***

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. The prior art used for these rejections is as follows:

16. Morich, M. U.S. Patent 5,296,810. Date of Patent: March 22, 1994. (Henceforth "**Morich**").

17. Weisstein, Eric. "Green's Function", from MathWorld – A Wolfram Web Resource. © 1999 CRC Press. (Henceforth "**MathWorld**").

18. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

**19. Claims 2, 3, 5, 8, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morich in view of MathWorld.**

20. In regards to claim 2, while Morich teaches the use of Fourier transforms (see col.11, lines 50-52; and col.12, lines 25-29; and col.7, lines 63-66), Morich does not expressly teaches the use of Green's function, as claimed:

2. A method of designing a magnetic field gradient coil assembly as set forth in claim 1, wherein said step of setting or resetting the number of said inner coils and optimizing their positions such that a resulting magnetic field strength falls within a tolerable range of a target magnetic field gradient under shielded conditions uses a Green function.

MathWorld, on the other hand, expressly teaches that "A Green's function is an integral kernel that can be used to solve an inhomogeneous differential equation with boundary conditions. It serves roughly an analogous role in partial differential equations as does Fourier analysis in the solution of ordinary differential equations."

It therefore would have been obvious to one of ordinary skill in the art at the time the invention was made to use a Green's Function instead of Fourier analysis, because MathWorld teaches that "... It serves roughly an analogous role."

21. In regards to claim 3, while Morich teaches the use of Fourier transforms (see col.11, lines 50-52; and col.12, lines 25-29; and col.7, lines 63-66), Morich does not expressly teaches the use of Green's function, as claimed:

3. A method of designing a magnetic field gradient coil assembly as set forth in claim 1, wherein said step of calculating Fourier components of an electric current distribution necessary for the outer coils uses a Green function.

MathWorld, on the other hand, expressly teaches that "A Green's function is an integral kernel that can be used to solve an inhomogeneous differential equation with boundary conditions. It serves roughly an analogous role in partial

differential equations as does Fourier analysis in the solution of ordinary differential equations.”

It therefore would have been obvious to one of ordinary skill in the art at the time the invention was made to use a Green's Function instead of Fourier analysis, because MathWorld teaches that "... It serves roughly an analogous role.”

22. In regards to claim 5, while Morich teaches the use of Fourier transforms (see col.11, lines 50-52; and col.12, lines 25-29; and col.7, lines 63-66), Morich does not expressly teaches the use of Green's function, as claimed:

5. A method of designing a magnetic field gradient coil assembly as set forth in claim 1, wherein said step of calculating magnetic fields leaking from the inner and outer coils, respectively, and  
said step of calculating magnetic field distortions caused by eddy currents produced by the leaking magnetic fields use a Green function.

MathWorld, on the other hand, expressly teaches that "A Green's function is an integral kernel that can be used to solve an inhomogeneous differential equation with boundary conditions. It serves roughly an analogous role in partial differential equations as does Fourier analysis in the solution of ordinary differential equations.”

It therefore would have been obvious to one of ordinary skill in the art at the time the invention was made to use a Green's Function instead of Fourier analysis, because MathWorld teaches that "... It serves roughly an analogous role.”



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23. Claims 8, 9 and 11 are rejected based on the same reasoning as claims 2, 3, and 5. Claims 8, 9, and 11 are magnetic field gradient coil assembly claims that recite limitations equivalent to those in method claims 2, 3, and 5, which are taught throughout Morich.

### ***Conclusion***

24. Examiner notes that U.S. Patent 4,978,920, to Mansfield et al., uses both a Green's Function and a Fourier Transform in the design of a "magnetic field screen". See Mansfield et al., col.10, lines 34-57.

### ***Correspondence Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (571) 272-3714. The examiner can normally be reached on Monday through Thursday, and the first Friday of a biweek, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard can be reached at (571) 272-3749.

Any response to this office action should be faxed to (571) 273- 8300, or mailed to:

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P.O. Box 1450  
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or hand carried to:

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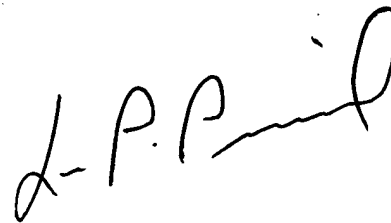
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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Tech Center 2100 Receptionist, whose telephone number is (571) 272-2100.

Ayal I. Sharon

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July 13, 2005

A handwritten signature in black ink, appearing to read 'L. Picard', with a stylized flourish at the end.

**LEO PICARD  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2100**